5.7

(1) step 1

Given L1 hit time of P1 = 0.62 ns

(a) Clock rate of P1 = $\frac{1}{(\text{L1 hit time})}$

$$P1 = \frac{1}{0.62\,ns}$$

$$\boxed{P1 = 1.613\ GHz}$$

step 2

(b) Given L1 hit time of P2 = 0.66 ns

Clock rate of P2 = $\frac{1}{(\text{L1 hit time})}$

$$P2 = \frac{1}{0.66\,ns}$$

$$\boxed{P2 = 1.515\ GHz}$$

step 3

(c)

Given L1 hit time of P1 = 0.96 ns

(b) Clock rate of P1 = $\frac{1}{(\text{L1 hit time})}$

$$P1 = \frac{1}{0.96\,ns}$$

$$\boxed{P1 = 1.041\ GHz}$$

step 4

(b)

Given L1 hit time of P2 = 1.08 ns

Clock rate of P2 = $\frac{1}{(\text{L1 hit time})}$

$$P2 = \frac{1}{1.08\,ns}$$

$$\boxed{P2 = 0.925\ GHz}$$

(2) for chap 5.7

(a) For Processor 1:

Given data

L1 hit time of P1 = 0.62 ns

L1 miss rate = 11.4%

Miss Penalty = AMAT$_{DRAM}$ = 70 ns

AMAT (Aver. Mem. Access Time) = (Hit time + (Miss rate * Miss Penalty))

AMAT = (0.62 + (11.4% * 70));

= (0.62 + 7.98)

AMAT = 8.6 ns

(b) For processor 2

Given data

L1 hit time of P2 = 0.66 ns

L1 hit rate of P2 = 8.0%

AMAT = (Hit time + (Miss rate * Miss Penalty));

= (0.66 + (8.0% * 70));

= (0.66 + 56)

AMAT = 6.26 ns

2E for the S-T

(a) For processor 1:

Given data

L1 hit time of P1 = 0.96 ns

L1 hit rate = 4.3 %

AMAT = (Hit time + (Miss rate * Miss Penalty))

= (0.96 + (4.3% * 70))

= (0.96 + 3.01)

AMAT = 3.97 ns

(b) For processor 2

Given data

L1 hit time of P2 = 1.08 ns

L1 hit rate = 3.4%

AMAT = (Hit time + (Miss rate * Miss Penalty))

= (1.08 + (3.4% * 70))

= (1.08 + 2.38)

AMAT = 3.46 ns

3 of chap 5.7

a) Given data:

Main memory access = 70 ns

(P1) L1 hit rate = 0.62 ns

(P1) L1 miss rate = 11.4%

(P2) L1 hit rate = 0.66 ns

(P2) L1 miss rate = 8.0%

Base CPI = 1.0

(b) CPI of P1

Miss Penalty = (main memory access × L1 hit time of P1)

= (70 × 0.62)

= 43.4

CPI_{memory} = (L1 miss rate of P1 × miss penalty)

CPI_{memory} = (0.114 × 43.4)

= 4.95

$CPI_{total} = CPI_{base} + CPI_{memory}$

$CPI_{total} = 1.0 + 4.95$

CPI total = 5.95

(c) CPI of P2

Miss Penalty = (main memory access × L1 hit time of P2

= (70 × 0.66)

= 46.2

CPI_{memory} = (L1 miss rate of P2 × miss Penalty)

CPI_{memory} = (0.08 × 462)

= 3.7

$CPI_{total} = CPI_{base} + CPI_{memory}$

$CPI_{total} = 1.0 + 3.7$

CPI total = 4.7 → Therefore P2 processor is faster

of 5.7

3d) Given data:

Main memory access = 70ns

P1 L1 hit rate = 0.96ns

P1 L1 miss rate = 4.3%

P2 L1 hit rate = 1.08ns

P2 L1 miss rate = 3.4%

Base CPI = 1.0

CPI of P1:

Miss Penalty = (main memory access × L1 hit time of P1)

= (70 × 0.96)

= 67.2

CPI_{memory} = (L1 miss rate of P1 × miss penalty)

CPI_{memory} = (0.034 × 67.2)

= 2.28

$CPI_{total} = CPI_{base} + CPI_{memory}$

CPI_{total} = 1.0 + 2.28

= 3.28

CPI of P2

miss penalty = (main memory access × L1 hit time of P2

= (70 × 1.08)

= 75.6

CPI_{memory} = (L1 miss rate of P2 × miss penalty)

CPI_{memory} = (0.034 × 75.6)

= 2.5

$CPI_{total} = CPI_{base} + CPI_{memory}$

CPI_{total} = 1.0 + 2.5

CPI_{total} = 3.5

Therefore P2 processor is faster

# of chapter 5.1

a) Given data

$Hit\ time_{L1} = 0.62\ ns$

$Hit\ time_{L2} = 3.22\ ns$

$Miss\ rate_{L1} = 11.4\%$

$Miss\ rate_{L2} = 98\%$

$Miss\ Penalty_{L2} = AMAT_{DRAM}$

$Miss\ Penalty = 70\ ns$

b) $Miss\ Penalty_{L1} = AMAT_{L2} = Hit\ time_{L2} + (Miss\ Rate_{L2} * Miss\ Penalty_{L2})$

$Miss\ Penalty_{L1} = (3.22 + 98\% \times 70)$

$= 3.22 + (0.98 \times 70)$

$= (3.22 + 68.6)$

$= 71.82\ ns$

c) $AMAT = Hit\ time_{L1} + (Miss\ Rate_{L1} \times Miss\ Penalty_{L1})$

$AMAT = 0.62 + (11.4\% \times 71,82)$

$= 0.62 + (0.114 \times 71,82)$

$= (0.62 + 8,187)$

$AMAT = 880\ ns$

Therefore AMAT is worse with L_2 cache

d) Given data

$Hit\ time_{L1} = 0,96\ ns$

$Hit\ time_{L2} = 11,48\ ns$

$Miss\ Rate_{L1} = 43\%$

$Miss\ Rate_{L2} = 73\%$

$Miss\ Penalty_{L2} = AMAT_{DRAM}$

$Miss\ Penalty_{L2} = 70\ ns$

e) $Miss\ Penalty_{L1} = AMAT_{L2} = Hit\ time_{L2} + (Miss\ Rate_{L2} + Miss\ Penalty_{L2})$

$Miss\ Penalty = (11,48 + (73\% \times 70)$

$= (11,48 + (0,73 \times 70))$

$= (11,48 + 51,1)$

$= 62,58\ ns$

f) $AMAT = Hit\ time_{L1} + (Miss\ Rate_{L1} \times Miss\ Penalty_{L1})$

$AMAT = (0.96 + (4.3\% \times 62,58)) \Rightarrow (0,96 + (0.043 \times 62,58)) \Rightarrow$

$\Rightarrow (0,96 + 2.64)$

$AMAT = 3.60\ ns$

AMAT is better with L2